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DOCUMENT-IDENTIFIER: JP 62150330 A
TITLE: LIQUID CRYSTAL SHUTTER DRIVING METHOD AND LIQUID CRYSTAL OPTICAL
PRINTER GRADATION RECORDING METHOD UTILIZING SAID METHOD

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INT-CL_(IPC): G02F001/133; B41J003/21 ; G02F001/133 ; G02F001/133
US-CL-CURRENT: 349/3,349/196

ABSTRACT:
PURPOSE: To raise the gradation controllability by adopting a signal inputting system of a positive type display system and also a negative logic, in a driving method of a liquid crystal shutter.

CONSTITUTION: A liquid crystal shutter 3 is driven statically by 15V applied voltage, and 5KHz driving frequency, and to electrodes 13, 13', usually a liquid crystal driving signal is applied, and a light beam is cut off. In such a state, as for a picture element for executing a display, it is stopped selectively to apply the liquid crystal driving signal, and a light beam is made to transmit (negative logic driving). In case of a positive type display, as for the liquid crystal shutter, a response from an open state to a closed state is quick, and a response from the closed state to the open state is slow. Since the shutter rises slowly from the closed state to the open state, therefore, an opening degree or an opening time of the picture element is

controlled by varying the signal input time, and the quantity of a light beam for transmitting through the picture element is brought to a gradation control.

PGPUB-DOCUMENT-NUMBER: 20010035925
DOCUMENT-IDENTIFIER: US 20010035925 A1
TITLE: Liquid crystal shutter and method of driving the same

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DETX:
[0058] When a DC or AC voltage of 10 to 20V is applied between the first electrode 2 and the second electrode 5, the molecules of the nematic liquid crystal 7 are orientated in the direction orthogonal to the transparent substrates 1 and 4 so that the birefringence is nullified, allowing linearly polarized light which has passed through the lower polarizing plate 8 to travel
intactly through the interior of the liquid crystal device to be blocked by the
upper polarizing plate 9, thus forming a black display at a closed state.

DOCUMENT-IDENTIFIER: US 5852485 A
TITLE: Liquid crystal display device and method for producing the same

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DEPR:
In the conventional LCD device in which the transparent electrode is provided
in the counter substrate, the dark state is realized by nullifying the phase contrast caused by birefringence of the liquid crystal material. The phase contrast caused by birefringence is nullified by rotating, by voltage application, the liquid crystal molecules from the state of being parallel to the surfaces of the two substrates interposing the liquid crystal layer to the
state of having an angle with respect to the surfaces of the two substrates. However, the phase contrast caused by birefringence can actually be nullified
only when the image is seen at a viewing angle normal to the surfaces of the
substrates. When the image is seen from a direction having even a slight angle
with respect to the normal direction, the phase contrast is caused by birefringence. Thus, in the case of normally-white display, light leaks to cause reduction in the contrast ratio and also inversion of the gray scale levels. In contrast, in the LCD device 1100 in Example 1 according to the present invention, the principal axis of the liquid crystal molecules 123 is substantially parallel to the surfaces of the two substrates 128 and 127, and
the voltage application does not rotate the liquid crystal molecules 123 in the
direction perpendicular to the surfaces of the two substrates 128 and 127. Accordingly, the difference in brightness caused in accordance with the viewing
angle is relatively small, significantly improving the viewing characteristic.